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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/873,287	06/05/2001	Tomio Sugiyama	2635-16	4759

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EXAMINER	
OLSEN, KAJ K	

ART UNIT	PAPER NUMBER
1753	

DATE MAILED: 09/16/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/873,287	SUGIYAMA, TOMIO	
	Examiner	Art Unit	
	Kaj K. Olsen	1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 June 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6,14 and 15* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6, 14, 15* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 4 and 14 are rejected under 35 U.S.C. 102(b) as being anticipated by Yamada (USP 5,288,389) with or without the further evidence by Fujishiro et al (USP 4,105,524).

3. Yamada discloses a multilayered gas sensing element for incorporation into a gas sensor installed in an exhaust system of an internal combustion engine, the multilayered gas sensing element comprising laminated layers comprising an least one solid electrolyte sheet (3, 10) containing zirconia and yttria and at least one insulating sheet (20, 22) containing alumina. See fig. 2 and 3 and col. 5, line 51 through col. 6, line 8. With respect to a crystal phase containing silicon dioxide that intervenes between the solid electrolyte sheet and the insulating sheet, the present disclosure evidences that silicon dioxide adding to the electrolyte followed by subsequent sintering results in the set forth bonding boundary. See page 5, lines 5-17 of the specification. Yamada discloses adding silicon dioxide to the electrolyte as a baking adhesive and teaches subsequent sintering. See col. 5, lines 54 and 55 and col. 6, lines 4-8. Hence, the set forth structure and electrolyte composition of Yamada would inherently result in the set forth bonding boundary.

4. This is further evidenced by the teaching of Fujishiro, which states that oxides such as SiO2 in the electrolyte form a "secondary phase distinct from the solid solution phase of" the

electrolyte and "exhibit strong affinity for the above metallic coatings". See col. 5, lines 21-26. Hence it would appear that it was already known in the prior art that materials like SiO2 form a phase distinct from the solid electrolyte phase on the surface of the electrolyte (i.e. where the electrodes of Fujishiro are) and assist in the bonding of layers to that electrolyte. This further evidences that the SiO2 of Yamada would have inherently provided a bonding boundary containing crystal phase SiO2 between the electrolyte and the insulating sheets.

5. With respect to the new limitation of claim 1 requiring the crystal phase being "at least a part of" a bonding boundary, any amount of crystal phase material would thereby meet this new limitation. Again, the similarities between the processes utilized by Yamada and the instant invention indicate that this would be an inherent result of the process of Yamada.

6. With respect to claim 4 including the new limitations to the claim, this would appear to be an inherent result of the adding SiO2 to the electrolyte. See above and the previous rejection.

7. With respect to new claim 14, this again would appear to be a phenomenological result of the process of the instant invention. In other words, applicant didn't choose these faces for bonding but rather the set forth Miller indexes are the specific faces of the electrolyte and insulator that resulted from the process of the instant invention. Absent a showing that process utilized by Yamada is distinct from the process of the instant invention and would not have provided the specified bonding boundary, then presumably Yamada also would have these set forth faces bonding to each other.

8. Claims 1 and 2 are rejected under 35 U.S.C. 102(b) as being anticipated by Ueno (USP 4,650,560).

9. Ueno discloses a multilayered gas sensor comprising a laminated layers comprising at least one electrolyte sheet 5 containing zirconia and yttria and an insulating sheet 23 containing alumina. See col. 5, lines 13-26. Ueno further discloses a bonding boundary (termed an "intermediate layer") 21 intervening between the solid electrolyte sheet and the insulating sheet and this intervening layer includes SiO2. See fig. 8, col. 5, lines 26-56 and claim 6. Alternatively, the "bonding agent" of Ueno would also read on the specified bonding boundary. See col. 5, lines 45-56. The examiners notes that the "SiO" referred to in col. 5 would appear to be either a typo or shorthand for --SiO2-- in view of claim 6 and the fact that there is no such material as SiO (i.e. silicon would only combine with oxygen in the +4 oxidation state). With respect to this bonding boundary being partly a crystal phase, it is made primarily of crystalline materials like ZrO2 and Al2O3.

10. With respect to claim 2, the bonding boundary also contains MgO.

Claim Rejections - 35 USC § 103

11. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

12. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamada in view of Esper et al (USP 4,183,798). Esper has been previously cited, but not previously relied on.

13. Yamada set forth all the limitations of the claim, but did not explicitly specify the presence of any of the set forth metal oxides. Esper teaches in an alternate electrolyte that a combination of stabilizing agents CaO and Y2O3 provides a desired specific resistance at a particularly low temperature. See col. 2, lines 10-17. This combination of CaO and Y2O3

would meet the "yttria" requirement of claim 1 and the presence of CaO of claim 2 as evidenced by Fujishiro, which disclosed that CaO and SiO2 would inherently form a bonding boundary of CaO and SiO2 (see discussion above). It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teaching of Esper for the sensing element of Yamada in order to reduce the temperature needed to arrive at a desired specific resistance.

14. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable Yamada or Ueno in view of Ishiguro et al (USP 4,851,105).

15. This claim further differs by calling for the bonding boundary to be undulated. Ishiguro discloses a zirconia sheet bonded to an alumina-containing sheet 12 at an undulating boundary. See figure 2(b). It would have been obvious for Yamada or Ueno to adopt the undulating boundary of lshiguro in order to strength the anchoring/bonding of a zirconia sheet to an alumina sheet, as discussed at col. 6, lines 24-41 of Ishiguro.

16. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamada or Ueno in view of JP 9-26409 (hereafter "JP '409").

17. This claim further differs by calling for a difference in the coefficients of expansion of the zirconia sheet and the alumina sheet to be less than 2 x 1 0 to the minus 6. JP '409 discloses having that difference to be between 0 and 0.2%. See page 4, lines 7-8 of the translation. It would have been obvious for either Yamada or Ueno to adopt a virtually zero difference between these coefficients, as taught by JP '409, in order to minimize thermal stress. Both Yamada and Ueno recognized the need for minimal thermal stress. See Yamada, col. 7, lines 5-62 and Ueno, col. 5, lines 37-44.

18. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamada or Ueno in view of JP 08-114571 (hereafter "JP '571").

19. This claim further differs by calling for a sintering contraction coefficient difference between a zirconia sheet and an alumina sheet to be less than 3%. Japan '571 discloses such a sintering contraction coefficient difference. See the fourth line from the bottom of the English abstract. It would have been obvious for Yamada and Ueno to adopt this sintering contraction coefficient difference to minimize thermal stress. Again see Yamada, col. 7, lines 5-62 and Ueno, col. 5, lines 37-44.

20. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ueno in view of Mase et al (USP 4,798,693). Mase was previously utilized as a primary teaching against the claims. It is being utilized here as a secondary teaching for new claim 15.

21. Ueno set forth all the limitations of claim 15 and further showed a heater 25 embedded in an insulating layer 3. However, Ueno did not disclose how that heater was embedded into layer 3. Mase teaches that heater elements can be embedded in insulating material by sandwiching two sheets of insulator (72, 76) about the heater element 30. See fig. 6 and 9 and col. 10, l. 64 through col. 11, l. 2. It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize two insulating layers sandwiched about the heater element (as taught by Mase) to make the insulating layer 3 of Ueno because the use of known methods for embedding heaters into insulating layers requires only routine skill in the art. If the heater of Ueno were embedded between two insulating sheets as Mase teaches, then Ueno would thereby meet the claim requirement that a heater be directly attached to a side surface of the insulating

sheet (i.e. the portion of 3 being above the heater in fig. 8), which would transfer heat to the insulating sheet and electrolyte sheet.

Response to Arguments

22. Applicant's arguments filed June 28, 2005 have been fully considered but they are not persuasive. With respect to Yamada, applicant urges that Yamada does not teach the bonding of the solid electrolyte plate 3 or 10 and the inner spacers 20 and 22. This is incorrect. Col. 6, ll. 4-8 states that the concentration cell 8 (containing electrolyte 3) and pump element 16 (containing the electrolyte 10) and insulating spacers 20 and 22 are pressed into a stack and sintered together. This would appear to be analogous to the instant invention process that resulted in the crystal phase of SiO2. See page 5, lines 5-17. Applicant urges that the heaters of Yamada must be placed separately from the oxygen sensor to lower thermal shock. It is unclear how applicant arrived at that conclusion as it doesn't appear to be based on any discussion from Yamada. Furthermore, it is not clear why this is relevant with respect to the rejection because none of the rejected claims state anything about a heater. New claim 15 does refer to a heater, but the examiner is not rejecting claim 15 over the teaching of Yamada.

23. With respect to Fujishiro, applicant urges that Fujishiro does not teach bonding between a solid electrolyte sheet and an insulating sheet. The examiner agrees and it is noted that the examiner only utilized Fujishiro as an evidentiary teaching. However, Fujishiro does show that SiO2 placed in an electrolyte was known to form a secondary phase distinct from the electrolyte that facilitates adhesion of objects to the electrolyte. In the case of Fujishiro, that something is a metallic coating (hence no rejection of the claims over Fujishiro). However, this reference was

utilized to reinforce the examiner's conclusion that the SiO2 of Yamada would have formed a phase distinct from the electrolyte at the boundary of the electrolyte. Hence, the examiner's conclusion comes not only from the evidence provided by the instant invention disclosure, but also from the prior art's understanding of the effect of SiO2 in an electrolyte.

24. With respect to Ueno, applicant appears to be urging that the solid electrolyte body and the insulating substrate are bonding based on a bonding agent and not a crystal phase containing SiO2. First, this argument misses the first part of the rejection where Ueno was relied on for the fact that layer 21 contains SiO2 presumably in a crystalline structure (see the previous rejection repeated above). Applicant is apparently referring to the alternative rejection where the "bonding agent" is also interpreted as reading on the set forth "bonding boundary". With respect to this argument, it is unclear what the fact that this SiO2 is a "bonding agent" has on whether it reads on the claimed invention. The SiO2 is presumably in a crystalline structure (alumina, zirconia and silica are all crystalline materials) and it is intervening between the solid electrolyte and the insulating substrate. Hence it thereby meets the claims. This bonding agent might be different from the set forth bonding boundary of the instant invention, but applicant hasn't claimed that bonding boundary in a manner that reads free of the SiO2 containing "bonding agent" of Ueno.

25. The examiner has withdrawn to the use of Ueno for the amended claim 4 because neither of the bonding boundaries of Ueno would appear to allow the solid electrolyte to directly connect with the insulating sheet.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kaj K. Olsen whose telephone number is (571) 272-1344. The examiner can normally be reached on Monday through Thursday from 5:30 A.M. to 3:00 P.M. and on alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen, can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

AU 1753
September 14, 2005

KAJ K. OLSEN
PRIMARY EXAMINER